Operator Manual

HIAC GLYCOUNT
PORTABLE GLYCOL ANALYSIS SYSTEM

HACH ULTRA™

EXCELLENCE IN PROCESS ANALYTICS

Operator Manual

HIAC GLYCOUNT
PORTABLE GLYCOL ANALYSIS SYSTEM

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Manual Overview

About This Manual

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Safety Conventions

WARNING

A warning is used to indicate a condition which, if not met, could cause serious personal injury and/or death. Do not move beyond a warning until all conditions have been met.

CAUTION:

A caution is used to indicate a condition which, if not met, could cause damage to the equipment. Do not move beyond a caution until all conditions have been met.

Note:

A note is used to indicate important information or instructions that should be considered before operating the equipment.

General Safety Considerations

These safety guidelines should be read carefully and understood before operating the HIAC GlyCount.

- All service procedures should be conducted by properly trained service personnel.
- Make sure the Portable Glycol Analysis System is properly installed and all hydraulic connections are correctly installed before operation. Online operation may use high-pressure. All safety guidelines should be observed when using high-pressure devices.
- Follow all procedures in “Return Procedures” on page 43 before shipping a unit to a service center for repair or re-calibration.

WARNING

Only factory certified personnel should perform service of the GlyCount. Attempts by untrained personnel to disassemble, alter, modify or adjust the electronics and/or hydraulics may result in personal injury and damage to the GlyCount.

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HIAC GlyCount Operator Manual Addendum: Cleaning Instructions Warning

WARNING

Do not spray the GlyCount with cleaning solutions to clean the unit. Apply all cleaning solutions, including combustible solvents, with a clean cloth. Remove all combustible solvent residues before connecting or removing the power supply; otherwise, injury or death to personnel and/or damage to the GlyCount may occur.

Like all power supplies, the GlyCount power supply may produce and electrical spark when connected or disconnected to the GlyCount. The unit is not hermetically sealed, and a spark may ignite residual solvent. Spraying the GlyCount with any cleaning solutions will void the warranty and may result in injury or damage.

The pick-up tube is used to make the hydraulic connection between the GlyCount and the online adapter.

CAUTION:

Care must be taken not to bend the pick-up tube or scratch the lower end where the seal connection is made. Damage may cause leakage or misalignment with the online adapter.

The CO_2 bottle is a compressed gas cylinder under high pressure. Do not alter this cylinder in any way. Do not over-pressurize the cylinder. Do not expose the pressurized cylinder to temperatures in excess of 350 °F (177 °C). Valves must be installed or removed only by trained personnel. Cylinders exposed to a fire or heated to temperatures in excess of 350 °F (177 °C) should be condemned or hydrostatically tested prior to filling. Do not use caustic cleaners. Do not remove or cover the label on the cylinder.

WARNING

Release of the gas under uncontrolled conditions will result in a freezing spray. Improper use, filling, storage, or disposal of this cylinder may result in death, personal injury, and property damage.

Keep cylinder out of reach of children. This cylinder must only be filled by properly trained personnel in accordance with CGA Pamphlets P.1 and G-6.3 available from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, Virginia, 22202. It is unlawful to ship a filled CO_2 bottle within the USA due to the high pressure of its contents.

Follow all described procedures in “Return Procedures” on page 43 before shipping a unit to a service center for repair or re-calibration.

- Laser Safety – Class 1 Laser Product – Complies with 21 CFR Chapter 1, Subchapter J

CAUTION:

Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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WARNING

The following DANGER label is clearly visible on the body of the laser sensor inside the unit. Do not disassemble or attempt to service due to the possibility of eye damage.

The bottle adapter is a pressure vessel used for sample delivery through the GlyCount. It is critical that it is installed in the locked position before sampling. The bottle adapter must be aligned on the GlyCount and in the locked position.

WARNING

If the bottle adapter is not installed properly when pressurization begins, it can be forced off of the GlyCount and personal injury and/or damage to the GlyCount may occur.

Although the GlyCount is designed for rugged use, it is still an instrument that should be cared for and maintained as described in this manual. Following proper safety and handling instructions will promote accident free operation and prolong product life.

Warranty

Hach Ultra warrants that this instrument will be free of defects in materials and workmanship for a period of one (1) year from the shipping date. If any instrument covered under this warranty proves defective during this period, Hach Ultra will, at its option, either repair the defective product without charge for parts and labor, or provide an equivalent replacement in exchange for the defective product.

To obtain service under this warranty, the customer must notify the nearest Hach Ultra service support center on or before the expiration of the warranty period and follow their instructions for return of the defective instrument. The customer is responsible for all costs associated with packaging and transporting the defective unit to the service support center, and must prepay all shipping charges. Hach Ultra will pay for return shipping if the shipment is to a location within the same country as the service support center.

This warranty shall not apply to any defect failure or damage caused by improper use or maintenance or by inadequate maintenance or care. This warranty shall not apply to damage resulting from attempts by personnel other than Hach Ultra representatives, or factory-authorized and trained personnel, to install, repair or service the instrument; to damage resulting from improper use or connection to incompatible equipment; or to instruments that have been modified or integrated with other products when the effect of such modification or integration materially increases the time or difficulty of servicing the instrument.

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1 Introduction

The Portable Glycol Analysis System (GlyCount) is an intelligent, portable, and robust analysis instrument for measuring, storing, and reporting glycol contamination important for reliable filter system operation. The GlyCount provides the means to analyze pressurized fluids and lubricants in online or bottle sampling modes without interrupting machine operations.

The GlyCount is compatible with glycol hydraulic fluids, including MIL-H-5606 and Skydrol®. It is capable of online sampling at pressures up to 207 bar (3000 psi) and temperatures to 65 °C (149 °F). The GlyCount comes with refillable CO_2 bottles for low running costs while in the field and a shop-air port fitting for in-house operation.

Note:
Due to US shipping restrictions, the GlyCount is shipped with empty CO_2 bottles.

Features of the GlyCount include:

- Eight channel display
- Bottle or online sampling
- 500 sample memory
- High speed thermal printer
- Flash programmable
- Aluminum alloy sheet metal construction
- Built-in bottle sampler pressure chamber
- Compact power supply
- Refillable CO_2 bottle

1.1 General Equipment Description

The GlyCount is shown in Figure 1-1, Figure 1-2, and Figure 1-3.

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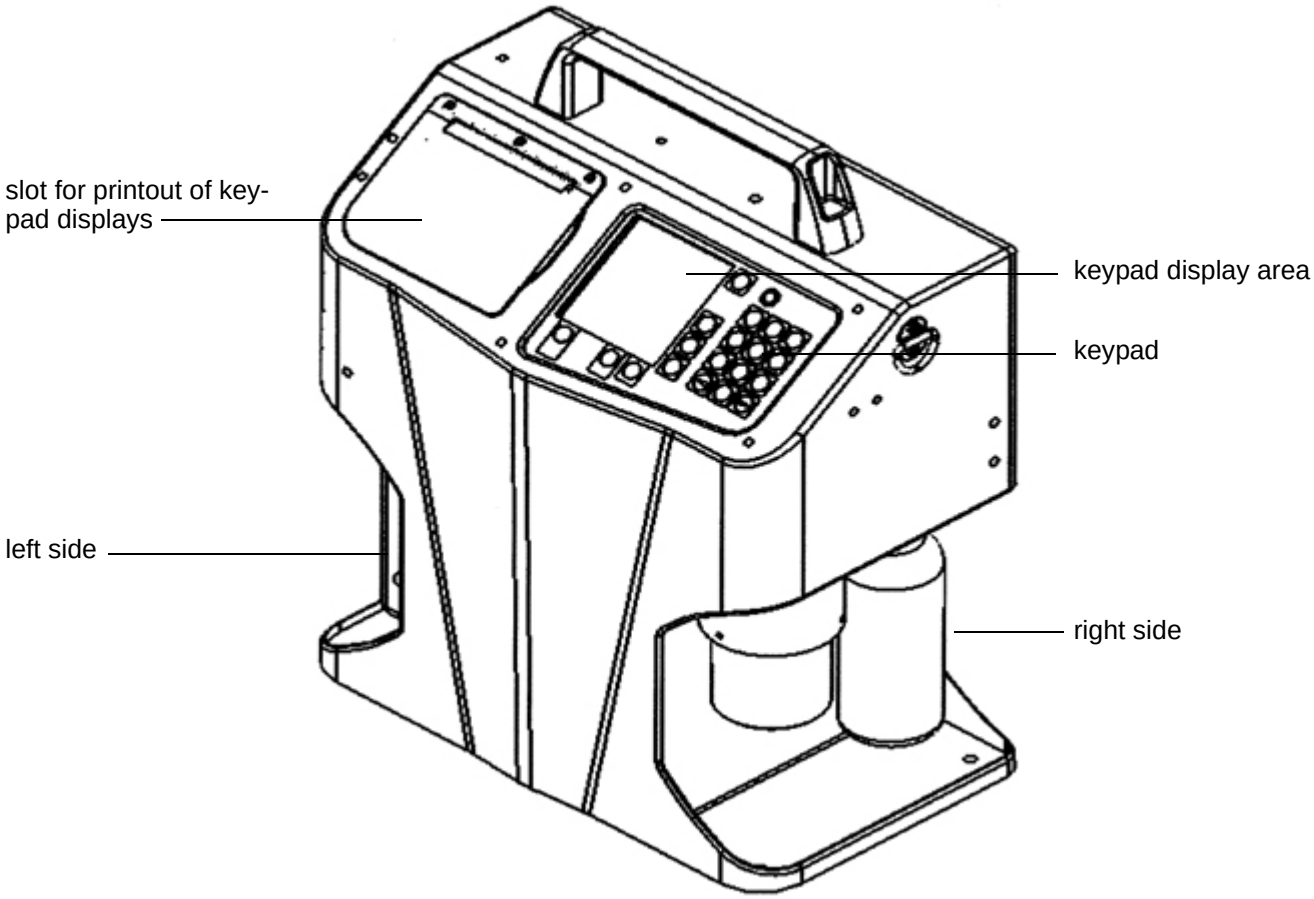

Fig 1-1 : Front View

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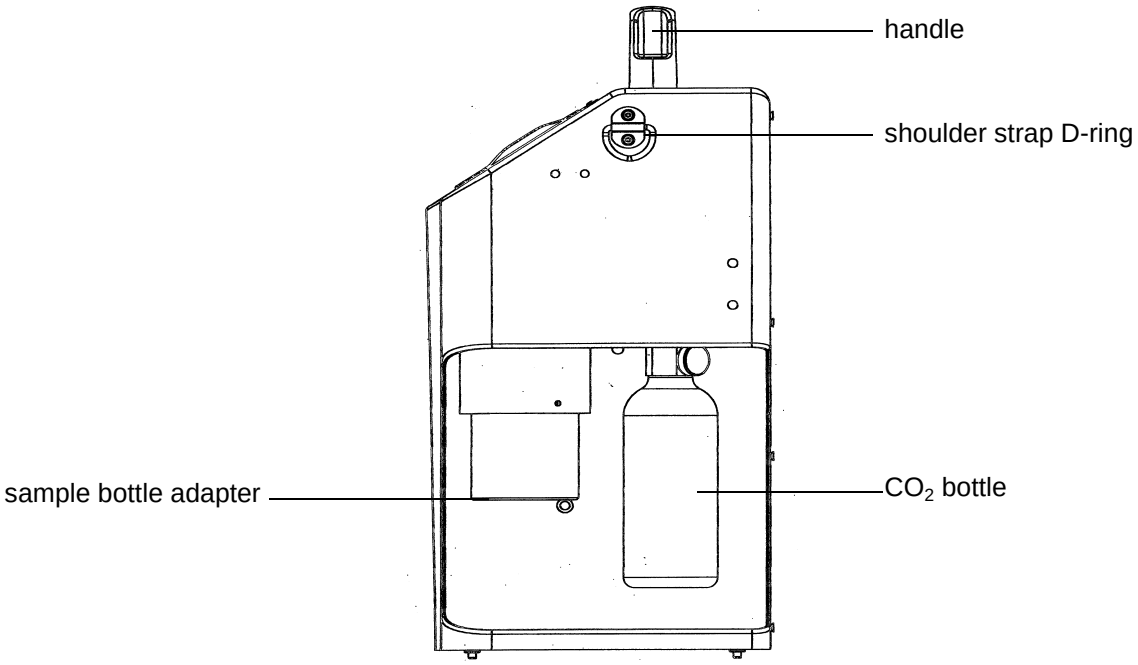

Fig 1-2 : Right Side View

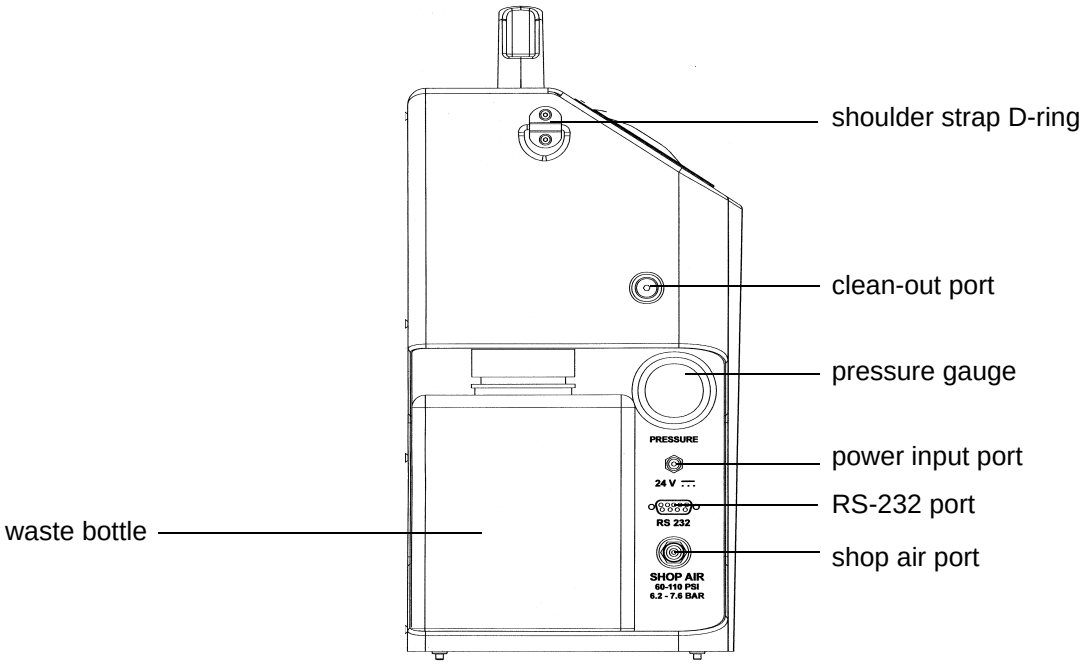

Fig 1-3 : Left Side View

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1.2 Unpacking Instructions

The GlyCount comes in a rugged plastic shipping container that includes casters and a convenient extension handle that makes transportation much easier. There are three standard handles and seven locking tabs around the perimeter of the lid. The container can be secured with the two padlock holes located on the front of the lid.

1) Remove any cardboard packaging material and place the shipping container on a level surface with the lid oriented on the top side.
2) Unlatch the seven locking tabs and lift the lid to an upright position.
3) Lift the GlyCount from the shipping container and place it on a flat surface in an upright position.
4) Remove the protective layer of plastic.

The GlyCount is now ready to set up and operate.

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2 Display and Keypad Operation

2.1 Using the Keypad

Figure 2-1 shows the features included on the keypad. There are four function keys that are reused throughout the menu tree.

- The **POWER** key toggles the power ON and OFF.
- The **START** key initiates a sample test.
- The **CANCEL** key cancels a sample test or cancels a programming function and maintains the previous selection.
- The **LINE FEED** key feeds the printer paper.
- The arrow keys are used to select operating variables and move the cursor left and right.

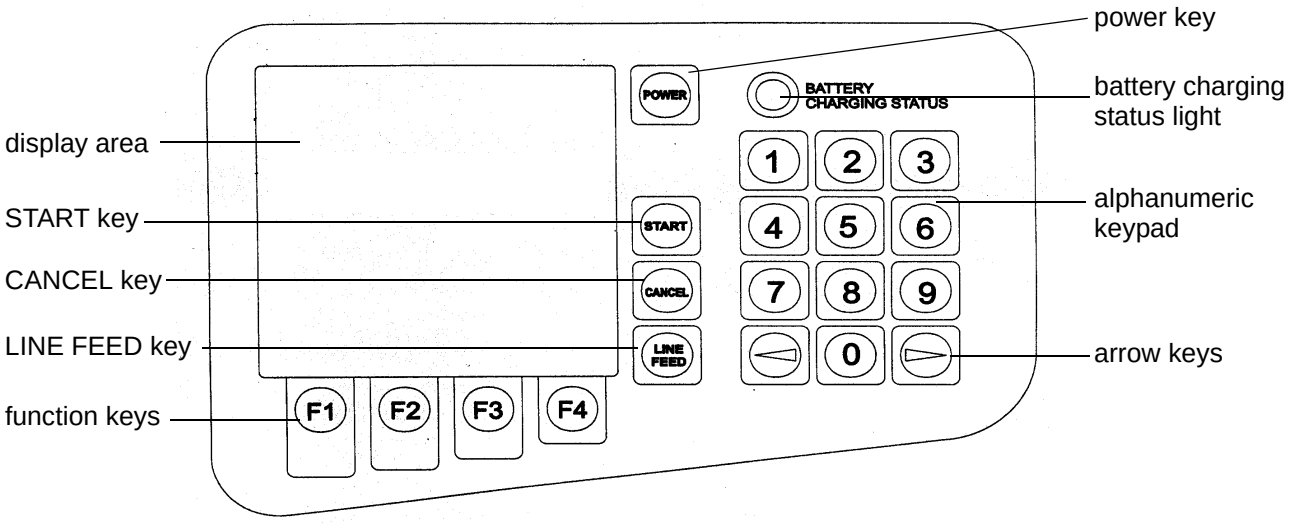

Fig 2-1 : Keypad Features

The display area provides the user with information on the counting process, error codes, sample test results, and the status of the operating variables. The **Battery Charging Status** lights indicate the current mode of operation for the charging system. See “Charging the Battery” on page 32 for more information.

The alphanumeric keys allow the user to input letters and numbers into the program. To input letters, simply press the key that contains the letter successively until the letter appears. Press once for the number, twice for the first letter, three times for the second letter, etc. Press the right arrow key to accept the current letter and move the cursor to the next character location. In certain programming menus, symbols may be entered by pressing the function keys that indicate the symbol to be used. Press F1 for a space, F2 for a forward slash, and F3 for a period.

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2.2 Understanding the Display

Along the bottom of the display are four bordered areas that correspond to four function keys, shown in Figure 2-1. These bordered areas display the attributes of the function keys and will change for different menus. To activate an attribute, press the function key that corresponds to the desired attribute.

The remainder of the display area shows information about the current menu, the results of a sample test, error messages, and act as a user interface during operation, in combination with the keypad.

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3 Functional Verification

3.1 Self-test Verification

When the "POWER" key is pressed, the GlyCount startup screen appears as shown in Figure 3-1.

Fig 3-1 : GlyCount Startup Screen

Next, the GlyCount initialization screen appears as shown in Figure 3-2:

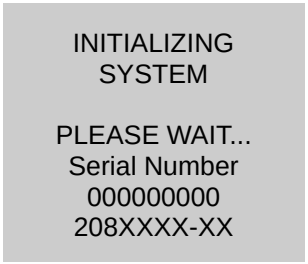

Fig 3-2 : GlyCount Initialization Screen

At this point, the GlyCount checks its internal systems for any problems. If a problem is found, the GlyCount displays an error message. For an explanation of the possible reasons for these errors, please see “Troubleshooting” on page 35. The firmware number can be verified at this stage for questions concerning firmware.

a) System Status Menu

Under the main menu, there is a system status menu. It can be accessed by pressing the F3 (SYS) key. This menu displays various system parameters that the GlyCount measures. The displayed parameters include:

- Power Supply
- Internal Temperature
- Printer Status

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The “Power Supply” screen will indicate whether the GlyCount is connected to the external power supply or is operating from the internal battery. During external power supply operation, the battery icon will indicate that the internal battery is under charging control. During battery operation, the battery icon will indicate the relative battery supply voltage capacity remaining. The useful battery voltage range for the GlyCount is 13.8 to 11.5 volts. The amount of battery life remaining below this range is minimal, so preparation for charging should be made before continuing operation.

The “Internal Temperature” screen indicates the temperature inside the GlyCount enclosure. It does not indicate the ambient temperature. This measurement determines if it is too hot or cold to perform a sample test.

The “Printer Status” screen shows the different status conditions or errors of the internal printer. A condition of “NORMAL” indicates the printer is functioning properly. An error message displays if a problem exists. See “Troubleshooting” on page 35 for an explanation of these error codes.

These system parameters display convenient information and diagnostic troubleshooting.

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4 Setup and Programming

4.1 External Pressure Sources

A CO_2 bottle or a “shop air” pressure source can be connected to the GlyCount to supply the external pressure. The following sections describe the requirements for each option:

a) CO_2 Bottles

Due to varying shipping rules and regulations, the CO_2 bottles contained in the shipping container will not be filled with CO_2. The bottles must be filled by a certified CO_2 supplier before use. Once filled, inspect the threads and O-ring for damage before connecting to the GlyCount. A clean lubricant is recommended for ease of use and to prevent damage to the O-ring.

To use a CO_2 bottle as an external pressure source:

1) Screw a bottle clockwise into the CO_2 port of the GlyCount.

As the bottle is threaded into the CO_2 port, the bottle valve will be opened and pressure will be applied to the GlyCount. When this occurs, the bottle will become difficult to turn.

2) Continue another ¼ turn until the bottle stops. If CO_2 begins to vent around the bottle threads when this pressurization occurs, remove the CO_2 bottle and inspect the O-ring for damage.

b) Shop Air

A compressed air source can also be connected to GlyCount at the shop air port. **It must be clean, dry** and between 90 to 110 psi (6.2 to 7.6 bar). If the shop air nipple included does not interchange with the system, install a new one. A 1/8-inch male NPT connection is required. Be sure to clean the port threads thoroughly before installing the new fitting to prevent debris from entering the pneumatic system.

Before attempting to connect any pressure source to the GlyCount, be sure to read the “General Safety Considerations” on page 3.

4.2 Programming Operation Variables

The operation variables are located under the Setup menu. They consist of the following:

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a) **Setup Menu**

1) SAMPLE LABEL: Selecting this variable will display a second menu, “Sample Text” menu. Under this menu the operator can program the following items:
    - SAMPLE LABEL “SAMPLE NAME”: User-input name for samples. The sample labels can be 10 characters long. For each sample label there is an auto-counter extension that increments up to 500. This extension is reset to one every time a new sample label is programmed, reentered, or exceeds a count of 500.
    - REMARKS: User-input remarks for any additional sample labeling, as desired. These optional remarks become part of the record of any completed samples. Records retrieved from the sample buffer can have their remarks reviewed and reedited as necessary. The sample remarks can be 10 characters long on any of three lines. Any existing remarks display on printed sample reports.

2) MODE: (BOTTLE or ONLINE FILTER) Sampling method
    - If *BOTTLE* mode is selected or reentered, a second screen displays to allow programming of the following variable:
    - PURGE VOL: (15-30 ml) Volume of fluid that will flow through the unit to purge any contamination before sampling.
    - If *ONLINE* mode is selected or reentered, a second screen displays to allow programming of the following variables:
    - NUM SAMPLES: (1-500) Numbers of samples that will run during the sampling period.
    - HOLD TIME: (Hours/Minutes) Time delay from the end of a sample to the start of the next sample. If set for 00:00, a minimum 5-second hold time will be set.
    - PURGE VOL: (15-999 ml) Volume of fluid that will flow through the hydraulic hose and unit to purge any contamination before sampling. The longer the hydraulic hose, the greater the purge volume must be.

3) STD: (ISO(C), ISO, NAS(C), NAS, NAV(C), NAV, SAE(C), SAE, MIL, P/10ml or P/1ml) Determines the Standard format to display the sample results.
4) VOL: (5, 10, 20, 50, or 100 ml) Volume of fluid that will be run three times during a sample (Volume/RUN). BOTTLE mode sampling is limited to 5, 10, or 20 ml per RUN only.
5) FLOW: The flow rate is fixed at 50 ml/min.
6) PRINT: (ENBL, DSBL or SETUP) Enables or disables the printer from automatically printing at the end of a sample. SETUP will print the current GlyCount setup.
7) CONTRAST: (Left/right arrow keys) Controls the display contrast.

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b) **Screen: PG 2**

1) LANG: (English, French, German, Span, and Ital) Determines the language that will be used in the operation and control of the GlyCount.
2) TEMP: (°C or °F) Determines the units to display temperature.
3) PRESS: (BAR or PSI) Determines the units to display pressure.
4) DISPL: (NORM or REV) Display viewed as light background (Normal) or dark background (Reversed).
5) BKLT: (ON, OFF, or AUTO) Controls the LCD display's back light. If AUTO is selected, the back light will turn off after five minutes of inactivity.
6) BEEP: (KEY or DSBL) Controls audio feedback of the beeper when a key is pressed.
7) BSAVE (battery save feature): This item is either "ENBL" (Enabled), or "DSBL" (Disabled). If enabled, the GlyCount will automatically shut off after 15 minutes of no activity (Idle state).

c) **Screen: SIZ:**

Programmable size menu. When MODE is set to P/1ml or P/10ml, PG2 menu becomes available for programming of any of the eight size channels. The minimum and maximum size programming is limited to a range of 4.0 to 68.0 μm, respectively. Size programming must also be in an ascending order from the smallest size on channel 1 to the largest size on channel 8.

Note:
The DEFAULT key (F2) may be used to reset all sizes to factory default settings.

d) **Screen: I/O:**

1) UNIT ID: (01 - 99) This programmable variable is used to set a unique device address used in serial communication of the GlyCount MODBUS protocol.
2) CNTRL: (LOCAL, REMOTE, or DOWNLOAD) Set to LOCAL when the GlyCount is manually operated. Set to REMOTE when a computer program operates and controls sampling of the GlyCount. Set to DOWNLOAD when a computer program is retrieving the records from the sample buffer only. The setting of this variable can also be changed automatically through the serial MODBUS protocol.

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e) Screen: CLK:

1) TIME: (Hours/Minutes/Seconds) Current time in 24-hour format.
2) DATE: (Month/Day/Year) Current date.

To program any operation variable, press the numeric number on the keypad that corresponds to the number on the left side of the variable to program. Press the F1 (PRG) function key and use the left/right arrow keys to select the proper setting or use the keypad to input numbers, letters[1] or symbols[2]. Press the F4 (↵) function key to accept the new setting or press “CANCEL” to return to the Setup menu and maintain the previous selection.

To view test results in a different Standard or Temperature, simply program the desired variables and view or print the test results from the buffer (see “Test Results” on page 25).

1. To input letters, simply press the numeric key that contains the letter to use in succession. Press once for the number, twice for the first letter, three times for the second letter, etc. The interval between the key presses determines if the current character is selected or if the next character will be selected.
2. To input symbols, simply press the function key that indicates the symbol to use. Press F1 for a space, F2 for a forward slash, and F3 for a period.

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5 Sample Handling Procedures

Sample handling procedures are very important for obtaining a representative sample of the contamination level of the system under test. The sample should be taken from a source with moving fluid.

Note:
If the sample is taken from a slow-moving stream (a “dead-leg”), a non-representative sample may result. It is recommended that a system be running for at least 30 minutes before a sample is taken.

Flushing of the GlyCount is also an essential procedure to obtain an accurate and representative sample. Upon finishing the previous series of tests, the sample still resides in the GlyCount. This fluid must be flushed out with a fluid that will not contaminate the next sample. Reducing contamination results in more statistically significant results.

For best results, flush the GlyCount with the same fluid type as intended for the next sample. Mixing or using other fluid types may cause sampling errors due to fluid incompatibility.

With online operation, the GlyCount will be flushed with the fluid to be tested. For proper flushing, the flush volume must be approximately twice that of the internal volume of the hydraulic hose that connects the GlyCount to the system to be tested.

Maximum flushing before sampling will ensure an accurate sample measurement. However, excessive flushing will result in premature clogging of the filter. See “Flushing the GlyCount” on page 21 for flushing instructions.

5.1 Bottle Sampling

Common sources of contamination inadvertently added to fluid samples come from the bottles, pick-up tube, and airborne particles. Only clean sample bottles should be used and they should be kept covered at all times.

As with any light blockage optical technology, sample inaccuracies will result from excess air and entrained gas. Both will be counted as particles. Ideally, air bubbles should be removed by applying a vacuum to the sample in a vacuum chamber or by placing the sample in an ultrasonic bath for several seconds.

Particles settle to the bottom of a sample bottle within minutes, so a sample should be shaken to re-suspend the particles and degas to remove bubbles.

Highly contaminated samples will saturate the sensor, making particle count data invalid. The GlyCount’s limit is 20,000 particles per ml at 5% coincidence loss (per ISO11171) and 30,000 particles per ml at 10% coincidence loss of fluid for a specific size. A general rule-of-thumb to follow is that if contamination can be seen suspended in a fluid sample, the sample may contain concentrations beyond the saturation limits of the GlyCount. The average person can only see particles greater than 40 μm in size.

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Sample fluids can be drawn from reservoirs with the use of the “vampire pump” that is included in the shipping container.

1) Cut a length of “clean” tube that can extend from the fluid in the reservoir to a point accessible from outside the reservoir.
2) Thread a clean sample bottle into the vampire pump. Install one end of the tube into the vampire pump so that it extends into the sample bottle and tighten the knurled knob.
3) Install the other end of the tube into the reservoir, being careful not to contaminate the end of the tube.
4) Actuate the vampire pump’s piston until the sample bottle is filled to the desired level.
5) Disconnect the sample bottle from the vampire pump and install the cap until the sample is ready to test.

5.2 Online Sampling

If handled properly, this is the most reliable method of obtaining a representative sample from a system. The hydraulic hose that connects the GlyCount to the system being tested must be purged to remove the previous fluid that was tested. Program the GlyCount for a purge volume approximately twice that of the internal volume of the hydraulic hose to be used.

The importance of the location of the systems test port for accurate sampling should not be underestimated. An application specialist should be consulted before installation of this port. Additional fluid control devices should not be installed on the hydraulic sample hose or the system’s test port. These devices can generate bubbles and create particle traps that may cause sample inaccuracies.

Suitable sampling points for online measurements with the GlyCount:

- Upstream of the high pressure filter (condition after pump)
- Upstream of the return filter (condition after system)
- Upstream of the bypass filter (tank condition)

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5.3 Flushing the GlyCount

The GlyCount can be flushed in both bottle and online modes.

a) Flushing in Bottle Mode

1) Verify that a CO_2 bottle or shop air pressure source has been connected to the GlyCount and that there is 90 to 110 psi (6.2 to 7.6 bar) indicated on the pressure gauge.
2) Disconnect the bottle adapter from the GlyCount by turning the adapter clockwise.
3) Fill a sample bottle with the fluid to be flushed. Place the sample bottle into the Bottle Adapter and reconnect it to the GlyCount by sliding the pick-up tube into the sample bottle and turning the adapter clockwise until locked.
4) From the main menu, press the F4 key to go into the flush menu and press “START.”
5) Press F1 (SOL ON). The bottle adapter pressurizes and fluid begins to exit the drain port. The amount of fluid being flushed is indicated on the display.
6) When the desired amount of fluid has been flushed, press “CANCEL” to stop flushing and return to the main menu.

CAUTION:
If the flushed volume exceeds the amount of fluid in the bottle adapter, pneumatic pressure will be flushed through the GlyCount and out of the drain port. This can create air pockets in the filter system and lead to sampling errors.

b) Flushing in Online Mode

1) Connect the online adapter to the GlyCount by sliding the pick-up tube into the hole in the center of the adapter and turning counter clockwise until locked.
2) Connect a hydraulic hose with a Minimess® test hose thread to the online adapter. Connect the other end of the hydraulic hose to the system to be tested.
3) From the main menu, press the F4 key to go into the flush menu and press “START.”
4) Fluid will begin to exit the drain port and the amount of fluid being flushed is indicated on the display.
5) When the desired amount of fluid has been flushed, press “CANCEL” to stop flushing and return to the main menu.

CAUTION:
Turning the power off while flushing causes the internal flow controller to remain open and allows fluid to continue flowing. Always cancel the flushing process and allow five seconds to pass before turning the GlyCount off.

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5.4 Fluid Compatibility

The GlyCount is compatible with most glycol based fluids within the specified viscosity and temperature ranges. If the compatibility of a desired fluid is in question, its compatibility should be checked against the wetted material list included in the “Performance Specifications” on page 45. If the compatibility cannot be determined, submit a request to a local Hach Ultra representative for a recommendation on the fluid’s use within the GlyCount. Refer to “Technical Support Information” on page 44 for contact information.

Note:
GlyCount internal components are not compatible with water. Water may cause instrument malfunction and damage. Glycount is only compatible with fluids containing lubricating and corrosion protection properties such as Ethylene Glycol.

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6 Taking a Sample

6.1 Bottle Mode

In this mode, a sample fluid is placed into the Bottle Adapter and connected to the GlyCount. An external pressure source is used to force the sample fluid through the GlyCount.

1) Set the sampling mode to “BOTTLE” and verify the other operation variables are programmed as needed. See “Programming Operation Variables” on page 17 for more information.
2) Verify that a CO_2 Bottle or shop air pressure source has been connected to the GlyCount and that there is 90 to 110 psi (6.2 to 7.6 bar) shown on the pressure gauge. Due to regulation variances, the pressure shown on the pressure gauge may creep up to 120 psi (8.3 bar) during no flow conditions. The pressure should drop when a sample is started.
3) Disconnect the bottle adapter from the GlyCount by turning counter-clockwise.
4) Fill a sample bottle with the fluid to be tested.
5) Place the sample bottle into the bottle adapter and re-connect it to the GlyCount by sliding the pick-up tube into the sample bottle and turning clockwise until locked.
6) Double-check to make sure the waste bottle can accommodate the fluid.
7) Press “START.”

The sampling process begins.

- The Bottle Adapter pressurizes and fluid exits from the drain port.
- The GlyCount has a fixed flow rate (50 ml/min). There are three consecutive sample runs at 5, 10, or 20 ml, depending on what was programmed.

When this process is completed, the test results are stored in the buffer, presented on the display and/or printed if the printer is enabled.

6.2 Online Mode

In this mode, a sample can be fed directly from a filter system. The reduced probability of contamination makes this the most accurate method of sampling. The CO_2 or shop air external pressure sources are not used in this mode because the hydraulic pressure forces the fluid through the GlyCount. However, they can remain connected during the sampling process if desired.

1) Set the sampling mode to “ONLINE” and program the desired number of runs, hold time, and purge volume. The purge volume should be approximately twice the internal volume of the hydraulic tube that connects the GlyCount to the system. Verify that the other operation variables are programmed as needed. See “Programming Operation Variables” on page 17 for more information.
2) Connect the online adapter to the GlyCount by sliding the pick-up tube into the hole in the center of the adapter and turning clockwise until the adapter is locked.
3) Connect a hydraulic hose with a Minimess test hose thread to the online adapter. Connect the other end of the hydraulic hose to the system to be tested.

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4) Press “START.” The sampling process begins and fluid will begin to exit from the drain port.

The GlyCount has a fixed flow rate (50 ml/min). There are three consecutive sample runs at 5, 10, 20, 50, or 100 ml, depending on what was programmed.

When this process is completed, the test results will be stored in the buffer, presented on the display and/or printed if the printer is enabled.

CAUTION:
Turning the power off on the GlyCount while sampling will cause the internal flow controller to remain open and allow fluid to continue flowing. Always allow the sampling process to finish or press cancel and allow five seconds to pass before turning the GlyCount off.

6.3 Filter Mode

The Filter Mode is designed to allow the user to monitor the fluid cleanliness level while filtering fluid. The user has to program sampling parameters, including sampler intervals, and target cleanliness levels. The GlyCount will take samples at programmed intervals while the system fluid is being filtered.

When the system fluid meets the programmed cleanliness level, the GlyCount will run an additional sample to confirm the fluid cleanliness level is stable. The GlyCount will then beep, stop sampling, and print the last two sample results if the printer is enabled. If the filter pump ON/OFF control solenoid is connected to the GlyCount via the optional I/O connection, then the pump will be turned ON when the filter start function is selected. The filter pump will automatically be turned OFF when the cleanliness level is achieved.

The GlyCount fluid pressure requirement varies with the fluid viscosity. Minimum pressure must be maintained to regulate fluid flow through the GlyCount unit. The GlyCount self-regulates based on fluid pressure and viscosity variation during sampling and filtering.

- Set the sampling mode to “FILTER,” program the desired hold time, purge volume and cleanliness level required. Verify the other operation variables are programmed as needed. See “Programming Operation Variables” on page 15 for more information.
- Connect the Online Adapter to the GlyCount by sliding the pick-up tube into the hole in the center of the adapter and turning counterclockwise until locked.
- Connect a hydraulic hose with a M16 X 2 test hose thread to the online adapter. Connect the other end of the hydraulic hose to the fluid source.
- **OPTIONAL—**Connect the filter pump solenoid control to the GlyCount I/O connector. (See “Input/Output Interface (I/O Port)” on page 30 for I/O port pin configurations.)
- Press the “START” button on the keypad after the filtering process has begun to ensure adequate press to deliver fluid to GlyCount unit. The GlyCount will run samples at the program interval. When the target cleanliness is detected, GlyCount will terminate the sampling process. Up to 500 test results will be stored in the buffer, presented on the display and/or printed if the printer is enabled.

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7 Test Results

7.1 Displayed Information

Figure 7-1 shows a typical test report. It indicates the name of the sample, serial number of the unit that took the sample, date and time the sample was taken, volume per sample run, flow rate, measured fluid temperature, concentration units, measured cleanliness in the desired format, and the count data per micron size. The count data show the number of counts per individual run and the average of the three runs.

GlyCount

GLYCOL SAMPLE REPORT

Sample: SAMPLENAME.1 Serial #: 000000000

APRIL 15, 2004

Time: 12:00:00 Sample Mode: ONLINE

Volume: 5 ml/RUN Flowrate: 50 ml/min

Fluid Temp: 73.2 F

Reported Concentration: Parts/1 ml

ISO Code: 18/116/8 (4µm/6µm/14µm) (µm(c))

SIZES	RUN1	RUN2	RUN3	AVG
4.0µm	1352.80	1324.00	1385/40	1353.40
4.6µm	405.00	406.00	427.60	412.87
6.0µm	330.40	323.00	333.20	328.87
9.8µm	7.00	11.40	13.00	10.47
14.0µm	2.20	1.60	2.20	2.00
21.2µm	0.60	0.00	0.00	0.20
38.0µm	0.00	0.00	0.00	0.00
68.0µm	0.00	0.00	0.00	0.00

* *

Fig 7-1 : Sample Test Report

For ISO Standard reporting, the run volume determines the lowest level of the contamination code. For a run volume of 5 ml the lowest reported ISO code level is 03/03/03. For a run volume of 10 ml the lowest reported ISO code level is 02/02/02. For a run volume of 20 ml the lowest reported ISO code level is 01/01/01. For additional information on this subject, see ISO 4406 “Hydraulic fluid power – Fluids – Code,” for defining the level of contamination by solid particles.”

The temperature displayed is the temperature at the end of the hydraulic circuit inside the flow controller. It is not a measurement of the incoming fluid temperature. The hydraulic circuit has thermal masses that influence the temperature of the fluid. If the GlyCount is colder then the

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fluid, there will be a temperature drop of the fluid while sampling. If the GlyCount is hotter, there will be a temperature increase of the fluid while sampling.

7.2 Interpretation of Results

The reported results should be compared to the corresponding target ranges for the system being tested. Fluid treatment or replacement can then be determined.

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8 Buffer Operation

8.1 Viewing the Contents

The contents of the buffer can be accessed by several means. Under the buffer menu, selecting “LAST SAMPLE” will display the results of the last sample that was performed. Selecting “LIST BUFFER” will display the eight most recent sample names for further review. Selecting “SEARCH BUFFER” will allow searching for a particular sample name by entering the entire or partial name of the sample to be found.

Once a sample selection has been made the next or previous samples can be selected by pressing the corresponding function keys.

The buffer contents will be displayed in the configuration that the GlyCount is currently programmed for. To display the results in a different configuration, change the operation variables to the desired configuration and view the buffer contents again.

8.2 Deleting and Printing

Under the buffer menu, pressing the F2 (DEL BUF) key will delete the entire buffer contents. The GlyCount will display a confirmation message and to prompt the user to accept or deny the operation.

Press the F3 (PRT BUF) key to print the entire buffer contents. The GlyCount will display a confirmation message and prompt the user to accept or deny the operation.

To delete or print an individual sample test result, simply press the F1 (DEL SMP) or F2 (PRT SMP) key while in the average count (AVG CNT) menu. The average count menu can be accessed while viewing a sample selection.

8.3 Sample Data

The sample data are viewed under two pages. When a sample selection has been made, the GlyCount displays the sample statistics for that particular sample. The remainder of the sample data can be viewed by pressing the average count (AVG CNT) function key.

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9 Communications

9.1 Remote Serial Interface (RS-232 Port)

The GlyCount is equipped with an RS-232 communications port. This port is used to communicate with a computer for data acquisition, analysis, and remote operation. This section gives the specifications and wire pin-outs for the RS-232 Port.

- BAUD RATE: 9600 baud
- Data Bits: 8 bits
- Parity: None
- Stop Bits: 2 bits

a) DB-9 Serial Connection

If the computer or terminal has a 9-pin serial port with a male connector, use a standard serial cable with one end male and the other female. The GlyCount is already configured as Data Communication Equipment (DCE), so the use of a null-modem cable is *not* required. The cable pin diagram is shown in Figure 9-1.

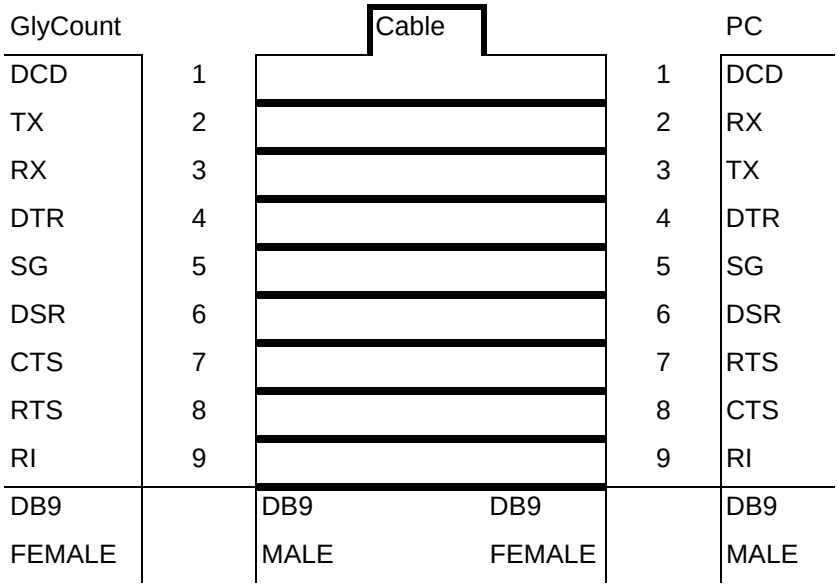

Fig 9-1 : RS-232 Cable Pin Diagram

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9.2 Input/Output Interface (I/O Port)

I/O Port Connection: Used for turning filter pump low voltage solenoid or relay.

Table 9-1 : I/O Connector Pin Function

Pin #	Function	Specification
1	Unused	
2	Unused	
3	Unused	
4	Unused	
5	Unused	
6	Unused	
7	Digital switch source voltage	+5VDC @ 25mA max
8	Digital switch driver	Open drain NFET
9	Unused	
10	Unused	

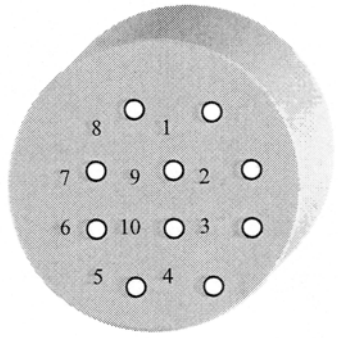

Fig 9-2 : I/O Connector Pin Diagram

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10 Maintenance and Service

This section describes how to clean and maintain the GlyCount.

10.1 Changing the Filter

1) Locate the filter housing above the waste container, as shown in Figure 10-1.

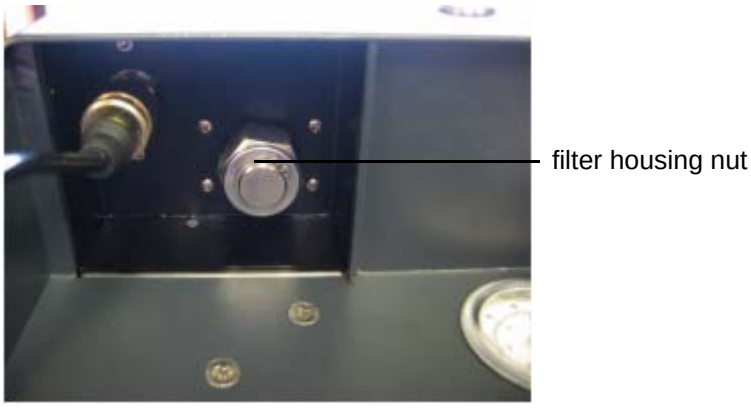

Fig 10-1 : Filter Housing Nut Location

2) Using a one-inch socket wrench, loosen the filter housing nut in a counter-clockwise direction.
3) Carefully remove the nut and the filter assembly, containing:
   - Ten (10) micron filter element
   - Spring
   - Stainless washer

Note:
Some glycol may come out with the filter assembly.

4) Check the contents of the new filter kit, part number 540-400-0025, to make sure the kit includes the filter element, a spring, and a stainless washer.
5) Install the new parts in the installation sequence shown in Figure 10-2. Install filter with the open end up.

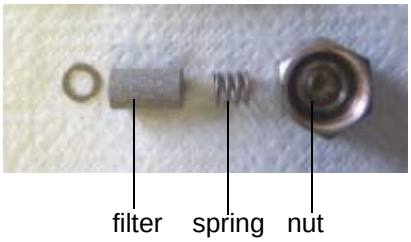

Fig 10-2 : Filter Installation Sequence

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6) Discard the old filter element, spring, and stainless washer.
7) Retighten the filter housing nut firmly but do not overtighten as the O-ring may be damaged.

Note:
Do not replace o-ring with non Aflas O-ring.

10.2 Charging the Battery

The GlyCount can be powered by two sources:

- internal rechargeable battery or
- external power supply.

In addition to supplying power to the GlyCount for operation, the external power supply has an additional purpose of charging the internal battery. The GlyCount can be operated while the internal battery is being charged.

1) To charge the internal battery, retrieve the external power supply and power cord from the shipping container.
2) Plug the power cord into the external power supply and the other end of the power cord into a 110V outlet.
3) Plug the external power supply jack into the GlyCount at the power port location.

Listen for a click and verify that the “Battery Charging Status” light, located on the keypad, is illuminated. This light will indicate one of three charging status modes, shown in Table 10-1.

Table 10-1 : Charging Status Indicators

Indicator	Charging Status
Steady green	Charging
Flashing green	Maintenance mode
Steady red	Battery charging failure

While operating on a fully charged internal battery, the GlyCount can perform a minimum of 100 samples before needing to be recharged.

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10.3 Changing the Printer Paper

1) Open the printer door.
2) Open the new roll of printer paper and orient it so the paper feeds from the bottom of the roll toward the GlyCount.
3) While the GlyCount is ON, insert the paper into the printer and press the “LINE FEED” key. The paper will feed through the printer.
4) Roll up the slack in the paper roll and push it into the paper holder.
5) Lift the free end of paper and close the printer door.
6) Tear off the excess paper.

Note:
In case of paper misalignment, lifting the lever on the left side of the printer will raise the printer carriage. The paper can then be pulled straight and aligned. Lower the carriage before operating printer.

10.4 Removing Flow Sensor Blockages

Follow the steps below to remove blockages from the flow cell. Use all precautionary steps to prevent damage to the instrument and personnel injury.

1) Disconnect the power supply.
2) Disconnect the air source.
3) Remove the sample cup and adapter.
4) Place glycol absorbent cloth under the unit to capture any glycol draining from the clean out port.
5) Retrieve the Allen wrench and cleaning brush from the shipping container.
6) Insert the wrench and turn counterclockwise to remove the clean-out port cap.
7) Slide the brush into the clean-out port until resistance is encountered.
8) Gently push the brush into the sensor flow cell with a twisting motion.

CAUTION:
Excessive pressure will result in brush and possible cell damage. If the brush will not go into the cell, pull the brush out and inspect the cleaning tip for damage.

9) Remove the cleaning brush and snug the clean-out port cap.
10) Reconnect the air source to the unit.
11) Run clean sample fluid through the instrument. Cover the wrench with glycol absorbent cloth and slightly loosen the clean-out cap while the sample run is in progress to purge any trapped air in the clean-out line. Fluid and air will squirt out of the clean-out port when the cap is loosen. Continue the process until there is no remaining air exiting from the port.
12) Tighten the clean-out port cap snugly. To avoid damaging the threads, do not over tighten the cap.

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11 Troubleshooting

The following list describes problems and error codes with recommended actions. If the described actions do not solve the problem, contact the customer service center.

For program malfunctions, the GlyCount can be defaulted by pressing and holding the F4 key while power is cycled.

Note:
This will erase the entire buffer contents and reset all of the operation variables to their factory settings. The message “GlyCount DEFAULTING” and the Firmware part number will be displayed as the GlyCount reinitializes its systems.

11.1 Procedural Problems

Sample runs out before test is complete:

- Sample bottle not properly filled.
- Programmed sample or purge volumes too large for the amount of sample.
- Trapped air volume in internal hydraulic tubing. Purge internal hydraulic tubing including clean-out port.
- Internal hydraulic leak. Contact the customer service center for repair.

The GlyCount will not turn ON when “POWER” key is pressed:

- Battery voltage too low. Connect external power supply to GlyCount for operation and charging.

11.2 Fatal Error Messages

a) Flow Controller Failure

"	FLOW	"
"	CONTROLLER	"
"	FAILURE.	"
“		"
"	PLEASE SEE	"
"	OPERATING	"
“	MANUAL	"

Fig 11-1 : Flow Controller Failure Error Message

Shown in Figure 11-1, the GlyCount is unable to detect the HOME switch on the flow controller during system initialization or at the end of a sample test.

- Cycle the power to allow the GlyCount to re-initialize its systems.
- Flow controller wire harness disconnection.
- Flow controller malfunction. Contact the customer service center for repair.

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b) Threshold Communication Failure

"	THRESHOLD "
"	COMMUNICATION "
"	FAILURE. "
“	“
"	PLEASE SEE "
"	OPERATING "
“	MANUAL. “

Fig 11-2 : Threshold Communication Failure Error Message

Shown in Figure 11-2, the GlyCount is unable to communicate with the Threshold Board. Sampling will terminate and will not be allowed.

- Threshold Board wiring harness disconnection.

c) Printer Initialization Failure

“	PRINTER “
"	INITIALIZATION "
"	FAILURE. "
"	"
"	PLEASE SEE "
"	OPERATING "
"	MANUAL. "

Fig 11-3 : Printer Initialization Failure Error Message

Shown in Figure 11-3, the GlyCount is unable to detect printer logic during system initialization.

- Printer Board wiring harness disconnection.

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d) **Flow Regulation Failure**

“	FLOW “
"	REGULATION "
"	FAILURE. "
"	"
"	PLEASE SEE "
"	OPERATING "
"	MANUAL. "

Fig 11-4 : Flow Regulation Failure Error Message

Figure 11-4 shows the message displayed when the GlyCount is unable to regulate flow rate within operational parameters. The sample test in progress will terminate.

- External pressure was depleted during sample test.
- The GlyCount was not purged before a change in viscosity of the sample fluid.
- Insufficient sample fluid.
- Attempt to flush the system. See “Flushing the GlyCount” on page 21.

e) **Low Flow Rate**

“	LOW “
"	FLOW RATE "
"	ERROR. "
"	"
"	POSSIBLE "
"	HIGH "

Fig 11-5 : Low Flow Rate Error Message

Figure 11-5 shows the message displayed when the GlyCount is unable to regulate flow rate above the operational lower limit. The sample test in progress will terminate.

- External pressure was depleted during sample test.
- GlyCount not purged before a change in viscosity of the sample fluid.
- Pick-up tube cap not removed.

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f) Insufficient Hydraulic Pressure

"	INSUFFICIENT "
"	HYDRAULIC "
"	PRESSURE "
"	FOR "
"	SAMPLING. "

Fig 11-6 : Insufficient Hydraulic Pressure Error Message

Figure 11-6 shows the message displayed in online mode after one minute of waiting for hydraulic pressure to increase above operational lower limit. Sampling will terminate.

- Hydraulic pressure source insufficient.

g) High Pressure Detected

"	HIGH "
"	PRESSURE "
"	DETECTED. "
"	"
"	POSSIBLE "
"	REGULATOR "
"	FAILURE. "

Fig 11-7 : High Pressure Error Message

Figure 11-7 shows the message displayed when internal hydraulic pressure increases above operational limit. Sampling will terminate.

- Internal hydraulic regulator failure or adjustment setting out of tolerance. Contact the customer service center for repair.

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h) Low Pressure

“	LOW “
"	PRESSURE "
"	ERROR. "
"	"
"	PLEASE SEE "
"	OPERATING "
"	MANUAL. "

Fig 11-8 : Low Pressure Error Message

Figure 11-8 shows the message displayed in bottle mode after one minute of waiting for hydraulic pressure to increase above operational lower limit. Sampling will terminate.

- External pressure source insufficient.
- Pick-up tube cap not removed.

i) Insufficient Pressure

“	PRESSURE “
"	DROPPED TO AN "
"	INSUFFICIENT "
"	LEVEL. "

Fig 11-9 : Insufficient Pressure Error Message

Figure 11-9 shows the message displayed when internal hydraulic pressure drops below operational limit. Sampling will terminate.

- External pressure was depleted during sample test.
- Internal hydraulic regulator failure or adjustment setting out of tolerance. Contact the customer service center for repair.

j) High Internal Temperature

“	HIGH “
"	INTERNAL "
"	TEMPERATURE. "
"	"
"	SAMPLING "
"	NOT "
"	ALLOWED. "

Fig 11-10 : High Internal Temperature Error Message

Figure 11-10 shows the message displayed when the sample fluid temperature is above operational limits. Sampling will not be allowed.

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k) High Fluid Temperature

“ HIGH	“
" FLUID	"
" TEMPERATURE.	"
"	"
" SAMPLING	"
" ABORTED.	"

Fig 11-11 : High Fluid Temperature Error Message

Figure 11-11 shows the message displayed when the sample fluid temperature increases above operational limits during a sample test. Sampling will terminate.

l) Printer Error

“ PRINTER	“
" ERROR BELOW	"
" ERROR	"

Fig 11-12 : Insufficient Pressure Error Message

Figure 11-12 shows the message displayed when an attempt to print has been executed and a printer error condition exists.

These error messages may appear on the printer:

- **"PAPEROUT"** No printer paper installed.
- **"HEAD_V”** Printer head voltage error. Contact the customer service center for repair.
- **"HEAD_UP"** Printer head lever is in the up position. Lower lever.
- **"HEAD_T"** Printer head temperature error. Ambient temperature too high.
- **"FAILURE"** Printer head failure. Contact the customer service center for repair.

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m)Low Battery

```
“   **************   “
"   LOW              "
"   BATTERY          "
"   ERROR.           "
"                    "
"   PLEASE TURN      "
"   GlyCount         "
"   OFF.             "
"   **************   "
```

Fig 11-13 : Low Battery Failure Error Message

Figure 11-13 shows the message displayed when the absolute minimum battery voltage has been reached. The system terminates any sample or print job in progress, shuts system down into an idle state. An audible transducer (beeper) sounds once per second for approximately five seconds and then automatically turns the GlyCount off.

- Connect external power supply to GlyCount for operation and charging.

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11.3 Non-Fatal Error Messages

The following errors are non-fatal errors that are displayed on the results page, buffer and printout.

a) Sensor Flow Cell Error

Results Page: “SNSR CELL ERROR”

Printout: **SENSOR FLOW CELL ERROR**

Displayed when the sensor signal drops below a pre-determined value. The sample run will continue until finished and the error will be tagged onto the record and displayed on the printout. Several conditions can cause this error. The sensor cell could be blocked within the view area preventing the laser light to be seen by the detector, the sensor could be out of calibration resulting in a low signal, the laser or sensor electronics could have failed, or there is insufficient sample fluid.

- Perform the cell cleaning procedure as described on page 35.
- Return unit to service center for calibration or repair.
- Insufficient sample fluid.

b) High Internal Temperature Warning

Results Page: “INTL TEMP WARN”

Printout: **HIGH INTERNAL TEMPERATURE WARNING**

Displayed when the internal ambient temperature of the unit rises above 55 °C (131 °F). The sample run will continue until finished and the error will be tagged onto the record and displayed on the printout. A combination of high outside ambient temperature and high fluid temperature can cause this warning, or the unit could have been exposed to direct sunlight in hot conditions, or the unit could have been stored in a high temperature location like a closed car.

- Place unit in a cool area until it cools off.
- Reduce ambient or fluid temperature conditions.

c) “Steady Red” Indicator

Possible causes for a “Steady Red” indicator:

- Repeated attempts to begin a charging cycle on a fully charged battery (New charging cycles begin when external power is applied).
- Attempting to charge battery in a higher than normal ambient temperature condition. Batteries will get hot near their end-of-charge cycle. If ambient conditions are too hot, then a battery over-temperature condition will result and the Red indication will illuminate.
- The battery has been detected as faulty and should be replaced.

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Appendix A: Service Procedures

A.1 Calibration

The GlyCount must be returned annually for recalibration. The calibration date is displayed on the calibration sticker located on the serial plate inside the left side door behind the waste container. Each GlyCount unit is aligned and calibrated at the factory using procedures in accordance with the requirements of JIS B 9925:1997. Further, the particle sizing accuracy of the GlyCount is assured by using instruments and particle size standards whose accuracy is traceable either to NIST standards or to those of comparable national laboratories in Japan. Hach Ultra Analytical provides its customers documentary evidence of this compliance in the form of calibration certificates that accompany every unit shipped from the factory.

A.2 Return Procedures

To return the Portable Glycol Analysis System for service, complete the appropriate form that appears at the end of this section. For the most recent return procedure information, including copies of all required forms, call Hach Ultra at 800.866.8854 or +1 541.472.6500.

To return an instrument for credit, please contact the local sales representative.

WARNING

The following actions must be performed when returning any unit for any reason to prevent personal injury and/or damage to the unit.

- If installed, remove the CO_2 bottle from the unit and/or bottles from the carrying case. It is unlawful to ship filled CO_2 bottles in the USA due to their high-pressure contents. The service center does not require use of customer CO_2 bottles.
- **Flush the system with clean glycol fluid.** The service center technicians must handle the fluids within the unit when performing a service. If flushing is not possible, indicate what type of fluid is in the unit and if any safety precautions should be followed during servicing.
- Place the caps supplied with the unit over the sample and drain tubes to prevent fluid from leaking from the unit during shipment and causing damage to the internal electronics.
- Wipe the unit down to remove any fluid from the outside surfaces of the unit to prevent fluid from leaking from the unit during shipment and causing damage to the internal electronics.
- Empty the waste container.
- Remove the sample bottle from the sample adapter.

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A.3 Technical Support Information

Technical Support Engineers are available to provide high quality advice and recommendations for applications, product operation, measurement specifications, hardware and software, factory and customer site training.

Please provide name, company, phone, fax, model number, serial number and comment or question.

Call +1 (541) 472-6500
Toll Free (800) 866-8854 (US/CA)
Fax +1 (541) 474-7414
6:00 AM to 5:00 PM Pacific Time
Monday through Friday
E-mail: TechSupportGP@hachultra.com

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Appendix B: Performance Specifications

Number of Channels	8
Size channels:	ISO-MTD 4, 4.6, 6, 9.8, 14, 21.2, 38, 68 μm ACFTD ~1, 2, 5, 10, 25, 50, 100 μm
Flow Rate	50 ml/min
Light Source	Laser Diode
Calibration	PSL spheres in water ISO-MTD in glycol
Counting Efficiency	Meets JIS B9925:1997
Concentration Limit	20,000 particles per ml @ 5% coincidence loss (per ISO 11171) 30,000 particles/ml @ 10% coincidence
Fluid Temperature Range	0 to 65 °C @ 25 °C ambient (32 to 150 °F @ 77 °F)
Measured Fluid Temperature	0 to 65 °C, ±0.5°C (32 to 150 °F) @ ±0.9 °F
Viscosity Range	2 to 50 cSt
Wetted Materials	Brass, stainless steel, sapphire, PTFE, and Aflas®
Cleanliness Classification	ISO 4406-1991, ISO 4406-1999, NAS 1638, SAE AS 4059
Data storage	500 Sample Records
Serial Communication	RS-232

Bottle Operation

Sample Volume	3 runs (averaged of 5, 10, or 20 ml/run (programmable))
Purge Volume	15 to 30 ml (programmable)
Pressure Cartridge	CO_2, replaceable, rechargeable
Operating Time	60 samples (120 ml sample bottle)
Shop Air	90 to 110 psi (6.2 to 7.6 bar) clean, dry

Online Operation

Sample Volume	3 runs (averaged) of 5, 10, 20, 50, or 100 ml/run (programmable)
Purge Volume	25 to 999 ml (programmable)
Fluid Pressure	100 to 3000 psi (7 to 207 bar)

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Power

DC Input	+24 VDC @ 2 A max
AC Adapter	Universal 100-240 VAC, 50-60 Hz, 60 W
Battery	Nickel-Metal Hydride
Battery Operating Time	100 samples or 4 hours continuous
Battery Recharge Time	2.5 hours

Environment

Operating	32 to 122 °F (0 to 50 °C) 20 to 85% relative humidity, non-condensing
Storage	-40 to 158 °F (-40 to 70 °C) up to 98% relative humidity, non-condensing
Dimensions (D X W x H)	7 x 12.5 x 14 in. (17.8 x 33.0 x 35.6 cm)
Weight	18 lbs (8.5 kg)
Accessories Included	• Carrying case • High pressure hose adapter • CO_2 bottles • Sample bottles (glass) • Hand pump • Carrying strap • Cleaning brushes • 1/8 in. Allen wrench • Printer paper • Power supply and cord • Online adapter • Ultrasonic bath

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Appendix C: Accessories

Table C-1 and Table C-2 show the standard and optional accessories for the GlyCount.

Table C-1 : Standard Accessories

Item Name	Re-order Part Number
Reusable Shipping Container	SA-000197-01
Foam Insert for shipping container	MP000172-01,-02
Online Adapter	SA000008-01
Shoulder Strap	VP753400
AC/DC Power Supply	VP624002
U.S. Power Cord	VP6235001
U.S. DOT Rated CO_2 Bottles	VP760000
Sensor Cleaning Brushes (Pack of 2)	SA000066-01
Printer paper	460 511
High Pressure Hose	VP350000
Ultrasonic Benchtop PC-3	690-500-1172
100 ml Glass Sample Bottles	570-396-9217

Table C-2 : U.S. Optional Accessories

Item Name	Re-order Part Number	Description
GlyCount-Control Software	2087044	Software utility for data collection; compatible with Microsoft® Windows® 98, Windows 2000®, and Windows XP®
RS-232 Serial Interface Cable	EP096010	Cable that will connect a computer to a GlyCount for downloading data into software

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Appendix D: Reference Documents

D.1 Flow Diagram

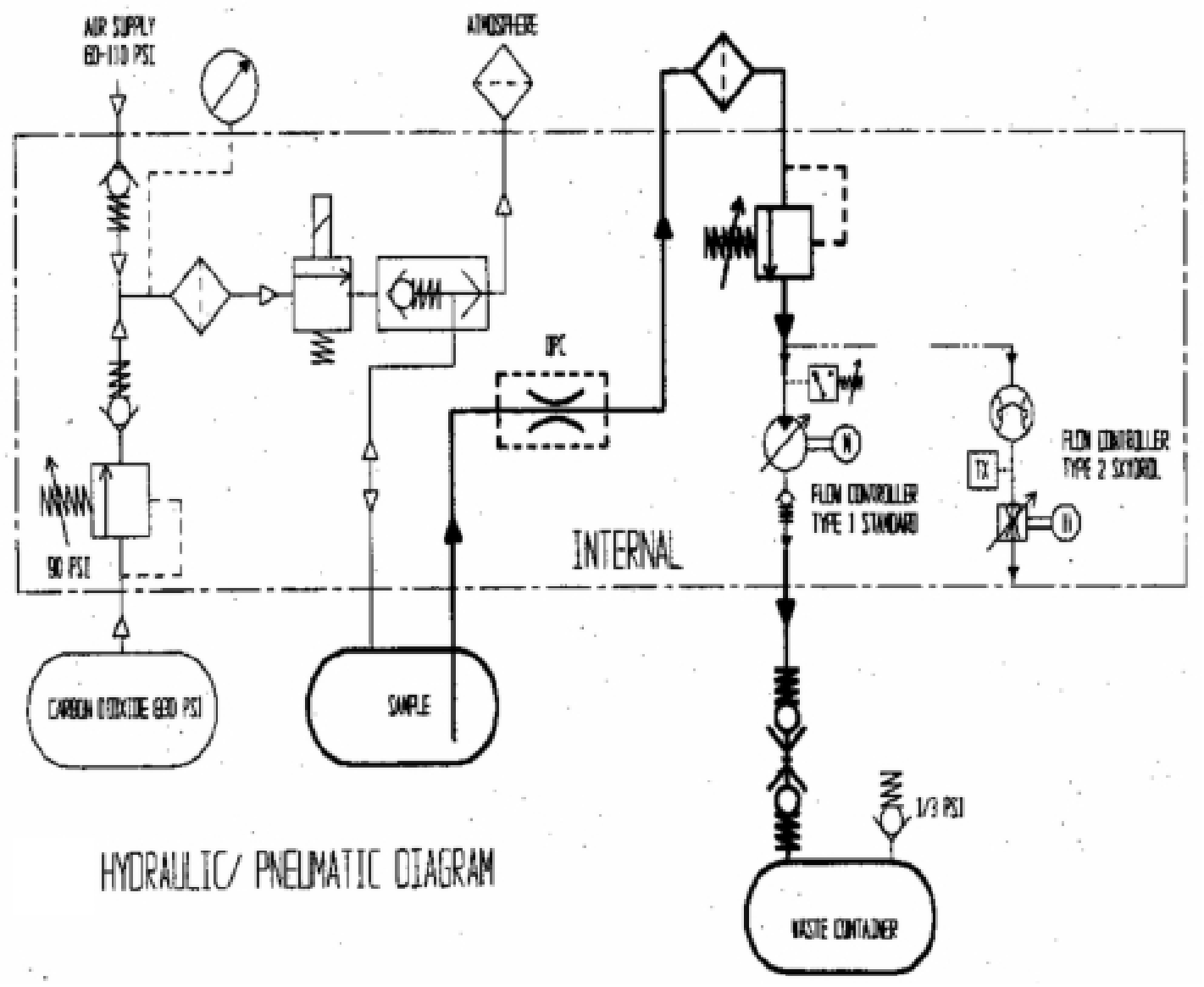

Fig D-1 : Flow Diagram

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Appendix E: Cleanliness Codes

E.1 Classification

The GlyCount is equipped to handle four cleanliness standards:

- ISO 4406:1999 for NIST/ISO 11171 (µm(c)), internally named ISO(C).
- ISO 4406:1999 for ACFTD/ISO 4402 sizes (µm), internally named ISOACF.
- NAS 1638:1992
- SAE AS4059

The cleanliness standards correlate to six internal standard settings. Select the applicable standard during setup. The selected standard is printed and stored in memory. At the time of printing, no cleanliness standard except ISO 4406:1999 specifies a specific calibration method. Usually users work with ACFTD-calibrations; however, since ACFTD is no longer considered valid calibration material, particle counter manufacturers must change to ISO-MTD calibrations. The other standards also have to use the ISO-MTD sizes if cleanliness codes remain the same.

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E.2 Codes

Table E-1 : ISO 4406: 1987 (E)

Number of Particles Per Milliliters (Counts/ml)		Scale Number
More Than	Up to and Including	
2500000		> 28
1300000	2500000	28
640000	1300000	27
320000	640000	26
160000	320000	25
80000	160000	24
40000	80000	23
20000	40000	22
10000	20000	21
5000	10000	20
2500	5000	19
1300	2500	18
640	1300	17
320	640	16
160	320	15
80	160	14
40	80	13
20	40	12
10	20	11
5	10	10
2.50	5	9
1.30	2.50	8
0.64	1.30	7
0.32	0.64	6

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Table E-1 : ISO 4406: 1987 (E) (Continued)

Number of Particles Per Milliliters (Counts/ml)		Scale Number
More Than	Up to and Including	
0.16	0.32	5
0.08	0.16	4
0.04	0.08	3
0.02	0.04	2
0.01	0.02	1
0.00	0.01	< 1

Table E-2 : NAS 1638 Contamination Classification System

Class	Maximum Particles/100mL in Specified Size Range (µm)				
	5-15	15-25	25-50	50-100	>100
00	125	22	4	1	0
0	250	44	8	2	0
1	500	89	16	3	1
2	1,000	178	32	6	1
3	2,000	356	63	11	2
4	4,000	712	126	22	4
5	8,000	1,425	253	45	8
6	16,000	2,850	506	90	16
7	32,000	5,700	1,012	180	32
8	64,000	11,400	2,025	360	64
9	128,000	22,800	4,050	720	128
10	256,000	45,600	8,100	1,440	256
11	512,000	91,200	16,200	2,880	512
12	1,024,000	182,400	32,400	5,760	1,024

Table E-3 : Equivalent APC Sizes Relating to Calibration Method

	Particle sizes					
ISO 11171 Size - µm(c)	>4	>6	>14	>21	>38	>70
ISO 4402 Size - µm	>1	>5	>15	>25	>50	>100

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Table E-4 : SAE AS4059

SAE AS4059 Rev. E Table 2 (Cleanliness Classes for Cumulative Counts)(Particles per 100 ml)

(1)	>1µm	>5µm	>15µm	>25µm	>50µm	>100µm
(2)	>4µm(c)	>6µm(c)	>14µm(c)	>21µm(c)	>38µm(c)	>70µm(c)
Size code	A	B	C	D	E	F
Classes						
000	195	76	14	3	1	0
00	390	152	27	5	1	0
0	780	304	54	10	2	0
1	1560	609	109	20	4	1
2	3120	1217	217	39	7	1
3	6250	2432	432	76	13	2
4	12500	4864	864	152	26	4
5	25000	9731	1731	306	53	8
6	50000	19462	3462	612	106	16
7	100000	38924	6924	1224	212	32
8	200000	77849	13849	2449	424	64
9	400000	155698	27698	4898	848	128
10	800000	311396	55396	9796	1696	256
11	1600000	622792	110792	19592	3392	512
12	3200000	1245584	221584	39184	6784	1024

(1) Size range, Optical microscope, based on longest dimension as measured per ARP598 or APC Calibrated per ISO 4402:1991

(2) Size range, APC Calibrated per ISO 11171 or Electron Microscope, based on projected area equivalent diameter

Complete standard available from www.sae.org.

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Appendix F: Applicable Standards

The following standards govern various aspects of the performance and use of particle counters described in this manual. Copies of these standards are available at cost from Hach Ultra.

- JIS B 9925-1997 Light Scattering Automatic Particle Counter
- ASTM F 658-87 (Re-approved 1992). Standard Practice for Defining Size Calibration, Resolution, and Counting Accuracy of a Liquid-Borne Particle Counter Using Near-Monodispersed Spherical Particulate Material.

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Appendix G: Glossary

µm	Micron. Particle size unit of measurement according to the former ACFTD calibration.
µm(c)	Particle size unit of measurement according to the new ISO 11171 calibration.
ACFTD	Air-Cleaner-Fine-Test-Dust is a filter test dust which has been used for 25 years in hydraulics for filter testing and was manufactured by General Motors Company until 1992, when production ceased. ACFTD was used until recently for the calibration of particle counters. The particle number concentration (particles/ml in oil) for a given dust addition (mg/L) was standardized in ISO 4402. During the years it became more and more apparent that this distribution was incorrect. With the introduction of ISO 11171 (1999), the old calibration standard (ISO 4402) becomes invalid, and ACFTD is no longer a valid calibration standard.
ACFTD-Sizes	GlyCount users can choose between ISOMTD- and ISOACF-standard settings. With ISOMTD the results are printed along with the NIST-sizes, with ISOACF the results are printed with the ACFTD-sizes.
Calibration, Primary	New particle counters must have a primary calibration by the manufacturer.
Calibration, Secondary	For recalibration at the service centers, secondary calibration may be used.
Concentration	The concentration in “Particles per Milliliter” (P/ml), is calculated by dividing the number of counts (P) by the measured fluid volume (ml). If needed, the result may also be displayed as “P/10 ml.”
ISO MTD	ISO MTD is the filter-test dust used in primary particle counter calibration. Its number distribution in dependence of the mass concentration is standardized in ISO 12103-1 (1997) for filter testing. ISO MTD replaced ACFTD as calibration material and material for the Multipass-Test. It is available from PTI Inc. in USA, or their European representative, ELIS COMPONENT. One certified batch of ISO MTD is available from NIST as SRM 2806 for primary particle counter calibration. For secondary calibration, NIST supplies dry dust (RM 8631) to be dispersed in oil.
Light Extinction	Light extinction, also called “light blockage” or “light-obscuration,” is a shadow measurement in the bright field. The laser projects a thin light sheet across the cell which hits directly on the single detector (PIN-diode) on the other side of the cell. Without the presence of a particle in the beam, the detector generates a maximum signal (10-Volt). When a particle enters the beam, it absorbs the light, cutting off part of the signal to the detector. This blockage detected by the detector is proportional to the cross-section of the particle.
Light Scattering	The light scattering principle is used to measure submicroscopic particles <1 µm because particles <1 µm are too small to be measured by light extinction. Instead of a single detector, multiple detectors are placed in the cell. The laser projects a thin light sheet across the cell. When a particle enters the beam, it scatters the light throughout the cell in a pattern proportional to its volume. This scattered light is collected by detectors which then determine the size of the particle from its size scatter pattern.
NIST	National Institute of Standards of the USA Address: SRM Sales Department, Building 202, Room 204, Gaithersburg, MD 20898, USA, Tel +1-301-975-6776 Fax +1-301-948-3730

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NIST/ISO-Sizes	The ISO 4406 (1999) is unchanged with respect to the concentrations of the cleanliness codes. However, since ISO MTD has higher concentrations under 10 µm and lower concentrations over 10 µm than ACFTD and the ISO-Code shall not change, particle counters with ISO MTD-calibration must measure with the NIST-sizes, count-equivalent to the ACFTD-sizes. Thus, a counter like the GlyCount, calibrated with ISO MTD, measures the same counts and ISO-codes at 4/ 4,6/ 6,4/ 9,8/ 13,6/ 21,2/ 38/ 68 µm(c) as an ACFTD-calibrated counter at 1/ 2/ 5/ 10/ 15/ 25/ 50/ 100 µm.
Run	With each run the particles in 5, 10 or 20 ml of glycol are counted. The three runs of each sample are measured one after another without interrupting the flow.
Sample	Each sample consists of a purge run and 3 consecutive runs. The purge run is necessary to measure and set the flow-rate and to purge the last sample, which may have introduced other contamination. All runs are printed and stored or transferred to the computer in the remote mode.
Shop Air connector	For USA/Canada, Hach Ultra Analytics delivers the GlyCount with an SAE-4, quick-connect fitting with a male 1/8-inch NPT thread.
SRM 2806	This material is a certified NIST standard for Primary Calibration of particle counters, which consists of two bottles, a 400 ml Mil-H-5606 with 2.8 mg/L ISO MTD.
TAN	TAN, the Total Acid Number, is the amount of KOH needed to neutralize the acid in the glycol being tested and is measured in (mgKOH/g).

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User Notes

DECLARATION of CONFORMITY

We,

Hach Ultra Analytics
481 California Avenue
Grants Pass, OR 97526

(Formerly Pacific Scientific Instruments Inc)

declare under sole responsibility that the

MODEL(s): PODS
PART NUMBER(s): 2087009-ALL

conforms to Directive 2004/108/EC for Electromagnetic Compatibility and Directive 2006/95/EC for Low Voltage. Compliance is accordance to the following specifications as listed in the official Journal of the European Communities:

EN 61326:2003, Class A, Group 1, Emissions:

EN 55011:1991 Class A Radiated
EN 55011:1991 Class A Conducted

EN 61326:2003, Immunity:

EN 61000-4-2 Electrostatic Discharge
EN 61000-4-3 Radiated Immunity, Amplitude Modulated
EN 61000-4-4 Electrical Fast Transient
EN 61000-4-5 Surge Transient
EN 61000-4-6 Conducted Immunity
EN 61000-4-8 Immunity to Power Frequency Magnetic Fields
EN 61000-4-11 Voltage Dips and Interrupts

EN 61010-1:2001 Amendments 1 & 2, Safety Requirement for Electrical Equipment for Measurement, Control and Laboratory Use

EN60825-1:2001 Safety of Laser Products, Equipment Classification, Requirements and User's Guide.

Hach Ultra Analytics
8-22-07
(Place and date of issue)

Terry Stange, Vice President of Engineering
Terry Stange
(Name/signature of authorized person)

	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user. *Note: For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment for proper disposal.* Important document. Retain with product records.
GERMAN Elektrogeräte, die mit diesem Symbol gekennzeichnet sind, dürfen in Europa nach dem 12. August 2005 nicht mehr über die öffentliche Abfallentsorgung entsorgt werden. In Übereinstimmung mit lokalen und nationalen europäischen Bestimmungen (EU-Richtlinie 2002/96/EC), müssen Benutzer von Elektrogeräten in Europa ab diesem Zeitpunkt alte bzw. zu verschrottende Geräte zur Entsorgung kostenfrei an den Hersteller zurückgeben. *Hinweis: Bitte wenden Sie sich an den Hersteller bzw. an den Händler, von dem Sie das Gerät bezogen haben, um Informationen zur Rückgabe des Altgeräts zur ordnungsgemäßen Entsorgung zu erhalten.* Wichtige Informationen. Bitte zusammen mit den Produktinformationen aufbewahren.	
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ITALIAN Le apparecchiature elettriche con apposto questo simbolo non possono essere smaltite nelle discariche pubbliche europee successivamente al 12 agosto 2005. In conformità alle normative europee locali e nazionali (Direttiva UE 2002/96/EC), gli utilizzatori europei di apparecchiature elettriche devono restituire al produttore le apparecchiature vecchie o a fine vita per lo smaltimento senza alcun costo a carico dell'utilizzatore. *Nota: Per conoscere le modalità di restituzione delle apparecchiature a fine vita da riciclare, contattare il produttore o il fornitore dell'apparecchiatura per un corretto smaltimento.* Documento importante. Conservare con la documentazione del prodotto.	
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SWEDISH Elektronikutrustning som är märkt med denna symbol kanske inte kan lämnas in på europeiska offentliga sopstationer efter 2005-08-12. Enligt europeiska lokala och nationella föreskrifter (EU-direktiv 2002/96/EC) måste användare av elektronikutrustning i Europa nu återlämna gammal eller utrangerad utrustning till tillverkaren för kassering utan kostnad för användaren. *Obs! Om du ska återlämna utrustning för återvinning ska du kontakta tillverkaren av utrustningen eller återförsäljaren för att få anvisningar om hur du återlämnar kasserad utrustning för att den ska bortskaffas på rätt sätt.* Viktigt dokument. Spara tillsammans med dina produktbeskrivningar.
SPANISH A partir del 12 de agosto de 2005, los equipos eléctricos que lleven este símbolo no deberán ser desechados en los puntos limpios europeos. De conformidad con las normativas europeas locales y nacionales (Directiva de la UE 2002/96/EC), a partir de esa fecha, los usuarios europeos de equipos eléctricos deberán devolver los equipos usados u obsoletos al fabricante de los mismos para su reciclado, sin coste alguno para el usuario. *Nota: Sírvase ponerse en contacto con el fabricante o proveedor de los equipos para solicitar instrucciones sobre cómo devolver los equipos obsoletos para su correcto reciclado.* Documento importante. Guardar junto con los registros de los equipos.
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POLISH Sprzęt elektryczny oznaczony takim symbolem nie może byćlikwidowany w europejskich systemach utylizacji po dniu 12 sierpnia 2005. Zgodnie z europejskimi, lokalnymi i państwowymi przepisami prawa (Dyrektywa Unii Europejskiej 2002/96/EC), użytkownicy sprzętu elektrycznego w Europie muszą obecnie przekazywać Producentowi stary sprzęt lub sprzęt po okresie użytkowania do bezpłatnej utylizacji. *Uwaga: Aby przekazać sprzęt do recyklingu, należy zwrócić siędo producenta lub dostawcy sprzętu w celu uzyskania instrukcji dotyczących procedur przekazywania do utylizacji sprzętu po okresie użytkowania.* Ważny dokument. Zachować z dokumentacją produktu.
PORTUGESE Qualquer equipamento eléctrico que ostente este símbolo não poderá ser eliminado através dos sistemas públicos europeus de tratamento de resíduos sólidos a partir de 12 de Agosto de 2005. De acordo com as normas locais e europeias (Directiva Europeia 2002/96/EC), os utilizadores europeus de equipamentos eléctricos deverão agora devolver os seus equipamentos velhos ou em fim de vida ao produtor para o respectivo tratamento sem quaisquer custos para o utilizador. *Nota: No que toca à devolução para reciclagem, por favor, contacte o produtor ou fornecedor do equipamento para instruções de devolução de equipamento em fim de vida para a sua correcta eliminação.* Documento importante. Mantenha junto dos registos do produto.

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本手册只包含出口到中　人民共和国的· 器的必要信息。

名称: Optical Particle Counter with Display

部件名称	有毒有害物· 或元素					
	· Pb	汞 Hg	· Cd	六价· Cr6+	多　· PBB	多　二· · PBDE
金属(底　\面板\部件\· 罩)	X	O	X	X	O	O
印刷　路板 (PCBA)	X	O	X	O	X	X
· &　· &接· (Wire/Conn)	X	O	X	O	X	X
· /　机/励磁器 (Pump or Fan)	X	O	X	X	X	X
光学元件 (Optical Comps)	X	O	O	O	O	O
玻璃 (Glass Fuses)	X	O	O	O	O	O
示器件 (Display)	X	X	O	O	O	O

O：表示· 有毒有害物· 在· 部件所有均· 材料中的含量均在 SJ/T11363-2006 · 准· 定的限量要求以下

X：表示· 有毒有害物· 至少在· 部件的某一均· 材料中的含量超出 SJ/T11363-2006 · 准· 定的限量要求

至出售之日，本表格已　示上述　子信息　品中　些零部件可能存在有害物· 。

除非　外特　的· 注, 此· 志　·　所　及　品的· 保使用期· 志. 某些可更· 的零部件会有一个不同的· 保使用期 (例如,　池　元模·)· 在其　品上.
此· 保使用期限只　用于　品是在　品手册中所· 定的条件下工作.

15

Form 011360

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